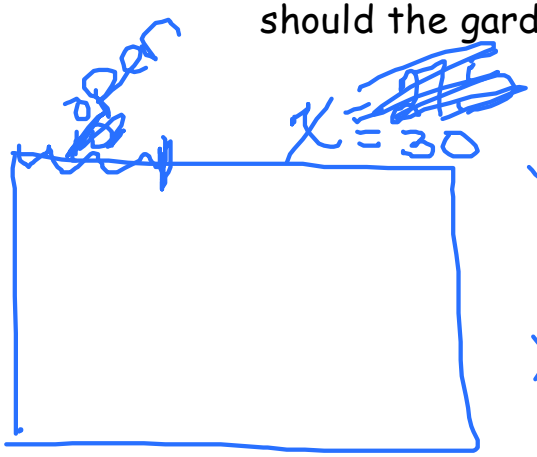
Unit 14
Day 5
Applications
Maximum and Minimum

Do #3, 4, 5

1) A ball is thrown straight up with an initial velocity of 64 feet per second. The height of the ball t seconds after it is thrown is given by the formula $h=64t-16t^2$. After how many seconds will it reach its maximum height? What will this maximum height be?

2) Dave has 120 feet of fence to make a rectangular kennel for his dog. If the house is used as one side of the kennel, what should the dimensions be to produce the maximum area?

3) Melissa plans to put a fence around her rectangular garden. She has 150 feet of fencing material to make the fence. If there is to be a 10-foot opening left for an entrance on one side of the garden, what dimensions should the garden be for maximum area?



$A = l \cdot w$

$A = (x+10)(70-x)$

$A = -x^2 + 60x + 700$

$x = \frac{-b}{2a} = \frac{-60}{-1(2)} = 30$

$\text{width} = \frac{150-(x+10)-x}{2} = \frac{140-2x}{2} = 70-x$

let x = length of fence on opening side

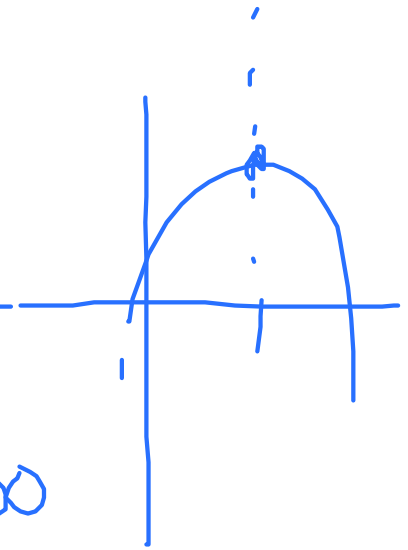
let $x+10$ = length = $10+30=40$

let x = width = $70-30=40$

4) An object is fired upward from the top of a 200-foot tower at a velocity of 80 feet per second. The height of the object t seconds after firing is given by the formula $h=-16t^2+80t+200$. After how many seconds will the object reach its maximum height? What will this maximum height be?

$h = -16t^2 + 80t + 200$

$-\frac{b}{2a}$ $\quad \frac{-80}{-16 \cdot 2} = \frac{80}{32} = 2.5$



$h(2.5) = -16(2.5)^2 + 80(2.5) + 200$

$= 300$

The object will meet a~~x~~ max height of 300 ft after 2.5 seconds.

5) Five hundred feet of chain link fence will be used to construct eight cages in a kennel. Find the dimensions that maximize the entire enclosed area for the cages. Do not assume that each cage is a square.

$5y + 3x = 500$

$5y = -3x + 500$

$y = -\frac{3}{5}x + 100$

50

x = length

$83\frac{1}{3}$ ft

Width in terms of x

$A = l \cdot w$

$A = x\left(-\frac{3}{5}x + 100\right)$

$A = -\frac{3}{5}x^2 + 100x$

$x = \frac{-100}{2 \cdot -\frac{3}{5}} = \frac{-100}{-\frac{6}{5}} = \frac{500}{6} = 83\frac{1}{3}$

50 ft x $83\frac{1}{3}$ ft

HOMEWORK:

Max and Min Worksheet 1-7